

Claims

[c1] What is claimed is:

1.A lowpass filter formed in a multi-layered substrate comprising:

a first MIM capacitor formed on at least two layers of the multi-layered substrate;

at least a mutually coupled coils (MCCs) structure comprising three coils, a first coil being electrically connected to the first MIM capacitor in series, and a second coil being connected between first coil and a third coil; and

a second MIM capacitor formed on at least two layers of the multi-layered substrate and electrically connected to the third coil in series.

[c2] 2.The lowpass filter of claim 1 wherein a top layer of the first lumped capacitor and a bottom layer of the second lumped capacitor are grounding layers for shielding the lowpass filter from external interference.

[c3] 3.The lowpass filter of claim 1 wherein the multi-layered substrate is a low temperature co-fired ceramic (LTCC) substrate.

- [c4] 4. The lowpass filter of claim 1 wherein the MCCs structure is realized in spiral form.
- [c5] 5. The lowpass filter of claim 4 wherein the spiral MCCs structure is arranged in a stacked configuration.
- [c6] 6. The lowpass filter of claim 4 wherein the spiral MCCs structure is a four-port element.
- [c7] 7. The lowpass filter of claim 4 wherein the rotation direction of the spiral MCCs structure can be clockwise or counterclockwise.